National Institute of Environmental Health Sciences

Anticipated human population and climate change effects on algal blooms of a toxic haptophyte in the south-central USA

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Abstract:

Effects of inflow on phytoplankton dynamics and assemblage structure have long been an interest of ecologists and resource managers, especially when they are linked to the incidence of harmful algal blooms. The frequency and magnitude of Prymnesium parvum bloom-preventing inflows likely in a drier landscape of south-central USA was explored, along with the relative importance of various factors important to blooms. We show that the number of large inflow events necessary to prevent blooms might decrease between 25% and 65% under drier conditions likely for this region. Long duration inflow events that are critical to lake flushing could nearly disappear, with inflow events lasting longer than 20 days decreasing 40-fold. These findings suggest that the frequency of P. parvum blooms and fish-kill events might increase in this region with human population and climate change. Multivariate analyses of monitoring data from multiple lakes indicate that other factors may be equally important to bloom occurrences. Inverse trends between toxic bloom events and nutrient concentrations, cyanobacteria, and lower pH are apparent. During periods when P. parvum populations were not toxic, an inverse relationship with zooplankton was observed. These other factors might be harnessed to mitigate P. parvum blooms in the future when inflows are reduced.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Food/Water Quality

Food/Water Quality: Biotoxin/Algal Bloom

Geographic Feature:

resource focuses on specific type of geography

Freshwater

Geographic Location:

resource focuses on specific location

United States

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Foodborne/Waterborne Disease

Foodborne/Waterborne Disease: Marine Toxin Syndrome

Mitigation/Adaptation: ☑

mitigation or adaptation strategy is a focus of resource

Mitigation

Model/Methodology: ☑

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Resource Type: ☑

format or standard characteristic of resource

Research Article

Timescale: ☑

time period studied

Short-Term (

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content